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USDA GRAIN STORAGE, HANDLING, AND
PROCESSING SAFETY COORDINATING SUBCOMMITTEE
ANNUAL REPORT
FISCAL YEAR 1990

JOHN C. FOLTZ
Chairman

LES MALONE
Executive Secretary

U.S. Department of Agriculture
Grain Storage, Handling, and Processing
Safety Coordinating Subcommittee

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William H. Tallent, Agricultural Research Service
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THE
HISTORY OF THE
CITY OF BOSTON

FROM THE FIRST SETTLEMENT
TO THE PRESENT TIME
BY
JOHN H. COLEMAN
OF THE
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Mention of commercial organizations in this publication is solely to provide specific information. It does not constitute endorsement by the U.S. Department of Agriculture over other organizations not mentioned.

December 1990

SUMMARY

Fires and explosions in the grain-handling system are a major concern to the grain industry. The U.S. Department of Agriculture shares this concern and maintains an integrated grain elevator safety program in the Department. In 1982, the Secretary of Agriculture, John R. Block, established the USDA Grain Storage, Handling, and Processing Safety Coordinating Subcommittee to provide departmental leadership and coordination for promoting safety in the efficient movement of grain from the farm to the domestic and export markets. This effort continues under Secretary of Agriculture Clayton Yeutter.

In addition to maintaining liaison and coordination with other governmental units and private sector groups, the USDA grain elevator safety program conducts scientific research on grain dust, maintains a data base on reported explosions in grain-handling facilities, operates a grain dust information center, and carries on continuing education and technology transfer to the grain industry.

During the past several years, other governmental and private sector groups have demonstrated leadership by developing aggressive programs in engineering and new technology, research, and education, as well as enforcement efforts to enhance worker safety and health in grain-handling facilities.

USDA GRAIN ELEVATOR SAFETY PROGRAM

This report was compiled in compliance with Departmental Regulation 1043-21, entitled "Grain Storage, Handling, and Processing Safety Program." The departmental regulation establishes a Safety Coordinating Subcommittee which reports to the Administration Committee of the Secretary's Policy and Coordination Council.

The Safety Coordinating Subcommittee is chaired by the Federal Grain Inspection Service (FGIS) Administrator. Other members of the subcommittee include agency administrators from the Agricultural Research Service (ARS), the Extension Service (ES), the Agricultural Stabilization and Conservation Service (ASCS), and the National Agricultural Library (NAL). The mission of the Safety Coordinating Subcommittee is to promote safety in grain-handling facilities by providing leadership and coordination in conjunction with other governmental and private sector groups. Specifically, the USDA Grain Elevator Safety Program was designed to undertake and accomplish specific safety initiatives within its legislative authority and existing levels of resources. The safety initiatives were identified by the Safety Coordinating Subcommittee and coordinated with industry and other governmental agencies with responsibility for safety in grain-handling operations.

The USDA Grain Elevator Safety Program policy areas include:

- 0 Protection of USDA employees working in grain-handling facilities.
- 0 Safety promotion.
- 0 Research and education.
- 0 Collection, analysis, and dissemination of information.

In carrying out the Grain Elevator Safety Program initiatives, FGIS maintains a central reporting, tracking, and monitoring system of explosion incidents in grain-handling facilities. To maintain an accurate data base, FGIS coordinates with representatives from Kansas State University, as well as the National Fire Protection Association and other groups on reported explosion incidents. Upon FGIS cross-validation of explosion information received by the Department, subsequent information is forwarded to the Occupational Safety and Health Administration (OSHA), Food and Drug Administration (FDA), and Environmental Protection Agency (EPA).

The ES safety initiative includes coordination, development, and dissemination of information, technology transfer, and other educational programs and materials under the auspices of the Cooperative Extension Service (CES) land-grant universities. CES conducts special safety training programs in coordination with industry and State trade associations for both employees and management. CES, union, industry, and trade association programs have enabled vital safety information to reach the grassroots levels. The National Institute for Occupational Safety and Health (NIOSH) provided special funding to ES to develop safety programs for small grain-handling facilities as well as the farmstead.

The NAL has developed a grain dust safety information center which serves as a valuable resource both at the national and international level. Secretary Yeutter placed a high priority on the importance of scientific and technical information being readily available to assist the agricultural community worldwide.

The ARS Grain Marketing Research Laboratory (USGMRL) located in Manhattan, Kansas, serves as the lead agency for research on grain dust safety for the Department. The USGMRL has undertaken or completed various studies to date in this area. The USGMRL coordinates many of its research studies with industry and other scientific groups. Several research projects have been completed and final reports have been written. The USGMRL also evaluates technical proposals on improving safety in grain-handling facilities submitted to the Department.

The Safety Coordinating Subcommittee also maintains liaison with Congress, other governmental agencies, private industry, trade associations, union groups, the academic community, and others who have a concern for safety in the grain-handling system.

The subcommittee held periodic meetings; prepared the USDA Grain Storage, Handling, and Processing Safety Coordinating Subcommittee annual report for fiscal year 1989; and distributed it to departmental officials, congressional committees, other governmental agencies, industry, union, trade groups, universities, insurance groups, and foreign countries upon request.

The USDA Grain Elevator Safety Program initiatives are presented in Exhibit A. These initiatives include the responsible lead agencies, updated project descriptions, and a summary of accomplishments in fiscal year 1990.

PRIVATE SECTOR AND GOVERNMENT

The U.S. Bureau of Mines continues to conduct studies on grain dust explosions. A report of their current effort is contained in Exhibit B.

During the past 8 years, private industry, trade organizations, and union groups, as well as the scientific community and the Federal Government, have increased their efforts to reduce fires and explosions in the grain-handling system. In particular, the National Grain and Feed Association (NGFA) has demonstrated its concern for safety by initiating 46 separate research and education projects which have resulted in improved elevator design, engineering, and technology. They have examined explosion venting, suppression, electrostatics, dust control, and several other areas. NGFA has invested nearly \$3 million in undertaking these research studies.

Forty-six projects have already been completed and information made available to the agricultural grain community worldwide.

NGFA has a committee charged with the development and dissemination of fire explosion safety information to the industry. This committee utilizes resources, including USDA's NAL, university holdings, and trade association programs, as well as NGFA's own library and research findings. The NGFA coordinates this information program with USDA, other

governmental groups, and State and other national trade associations. A listing of NGFA's research projects provided to the USDA Safety Coordinating Subcommittee is shown in Exhibit C.

During the past 8 years, a safety and health education program has been carried out by the Grain Elevator and Processing Society (GEAPS). The GEAPS Grain Industry Safety and Health Center conducted seminars designed to provide grain-handling facility management and other interested groups with the resources needed to develop, implement, and manage safety and health programs for employees working in grain-handling facilities. A listing of GEAPS safety programs provided to the USDA Safety Coordinating Subcommittee is shown as Exhibit D.

The Food and Allied Service Trades Department of the American Federation of Labor, and Congress of Industrial Organizations have conducted extensive training programs for grain elevator workers in the area of safety and health. They have developed slide/tape training materials as well as numerous pamphlets and fact sheets. Their activities are shown as Exhibit E.

Enforcement of Federal standards governing workers' safety is the responsibility of OSHA. OSHA has published in the Federal Register its standard for grain-handling facilities.

USDA GRAIN ELEVATOR SAFETY PROGRAM INITIATIVES

NO.	INITIATIVE	LEAD AGENCY
1.	Establish central reporting, tracking, and monitoring system of explosion incidents.	FGIS
2.	Establish central coordination, development, and dissemination of promotional and training material to the private sector and agricultural community.	ES
3.	Establish central collection, maintenance, and distribution of information related to research in grain-handling facilities.	NAL
4.	Evaluation and control of damage to grain from handling.	ARS
5.	Measurement and control of dust emission in grain-handling facilities.	ARS
6.	Explore and communicate alternate economical uses of grain dust. (Completed)	ARS
7.	Systematic studies on explosion and fire risks and hazards of grain-handling facilities.	ARS
8.	Conduct basic/applied research on the effects of relative humidity on explosions. (Completed)	ARS

USDA GRAIN STORAGE, HANDLING, AND PROCESSING
SAFETY PROGRAM INITIATIVES

FEDERAL GRAIN INSPECTION SERVICE

BACKGROUND:

The Administrator of FGIS, John C. Foltz, chairs the subcommittee. FGIS is responsible for establishing grain standards, promoting these standards within the industry, and regulating the inspection and weighing of all grain shipped from this country. FGIS maintains a nationwide system that ensures integrity in the inspection, weighing, and handling of U.S. grain both in the domestic and the export market. Federal employees work at export elevators, commodity plants, and other grain-handling facilities to accomplish this mission.

INITIATIVES:

(Initiative 1) FGIS established a central reporting, tracking, and monitoring system for grain dust explosion incidents. Fiscal year 1981 through 1990 information is contained in figures 1 through 5.

(FGIS Internal Initiative) FGIS provides a comprehensive safety and occupational health program to protect its employees who work in private sector grain-handling facilities. During FY 1990, some highlights of this internal program included the following:

- a. Employees received training in hazard recognition and avoidance.

- b. Employees were trained in first aid and cardiopulmonary resuscitation.
- c. Monthly meetings were held to discuss safety and health issues. Video tapes on safety related subjects were shown. Training materials were distributed. The employees were encouraged to actively participate in the safety and occupational health program.
- d. Research to determine an alternative to using the human nose to determine undesirable odors in grain is continuing.
- e. Field employees received training on the storage, use, and disposal of chemicals as part of the Federal Hazard Communication Program.
- f. A week long training seminar for collateral duty safety and health officials was held. All field offices were represented at the meeting.
- g. The video tape "Deadly Dust II" was shown to all field employees. This is a video on elevator explosion prevention.

Figure 1 - Grain dust explosions FY 1990

DATE	FACILITY	CITY	ST.	INJURY	FATAL
11/10/89	Sandahl Farm Service	Cherry Valley	IL	0	0
11/13/89	Hubinger Company	Keokuk	IA	0	0
11/22/89	Ogilvie Mills	Keokuk	IA	0	0
12/05/89	Quad County Cooperative	Exter	NE	2	0
12/10/89	Shawnee Terminal Elevator	Topeka	KS	0	0
02/21/90	Harvest States Coop.	Sherburn	MN	2	0
02/23/90	Riceland Foods	Jonesboro	AR	0	0
03/18/90	Delta Bulk Conveyor	Convent	LA	0	0
03/28/90	Ruehl & Arstein Feed Mill	Granger	WA	0	0
03/30/90	Midwest Grain Products	Atchinson	KS	0	0
04/16/90	Cargill Elevator	Reserve	LA	2	0
06/05/90	Kansas Blvd. Elevator (Cargill)	Kansas City	MO	2	0
06/06/90	Andersons River Elevator	Toledo	OH	0	0
06/24/90	Shadowdale Elevator, Inc.	Houston	TX	0	0
07/14/90	Midwest Grain Products	Atchinson	KS	0	0
08/31/90	Midwest Grain Products	Pekin	IL	0	0
09/05/90	Farr Better Feeds	Hereford	TX	3	0
09/10/90	Farmers Coop Elevator	Hanover	KS	0	0
TOTALS:	18 Incidents			<u>11</u>	<u>0</u>

The information regarding grain dust explosions was reported to FGIS through the cooperation of universities, insurers, trade groups, FGIS personnel, and a news clipping service. FGIS does not investigate grain dust explosions, and the public sector is not required to report explosions to FGIS. No deaths or injuries occurred to FGIS employees in any of the above listed incidents.

Figure 2 - Grain dust explosions
FY 1990

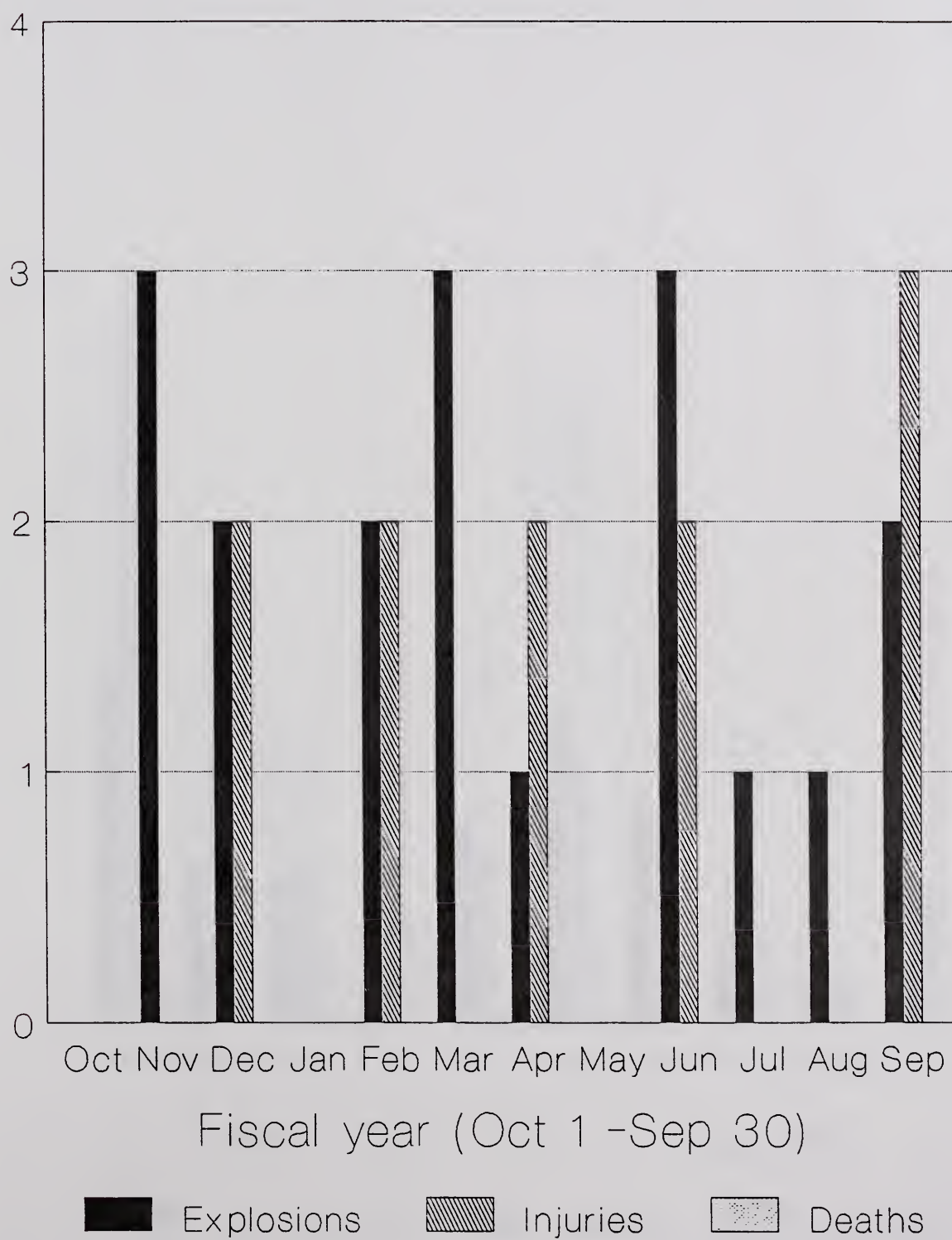


Figure 3 - Grain dust explosions
FY 1981-90

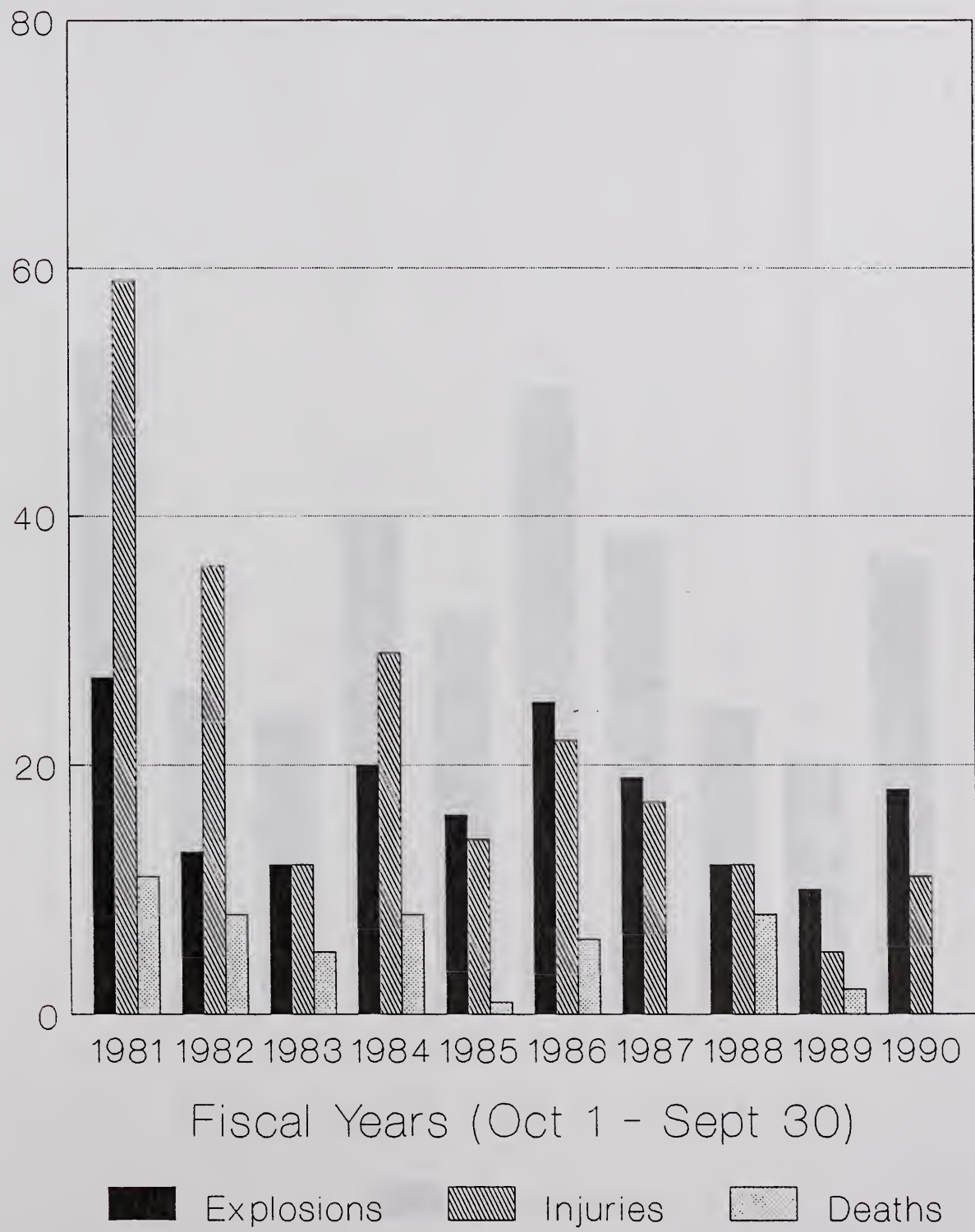


Figure 4 - Grain dust explosions
FY 1981-90

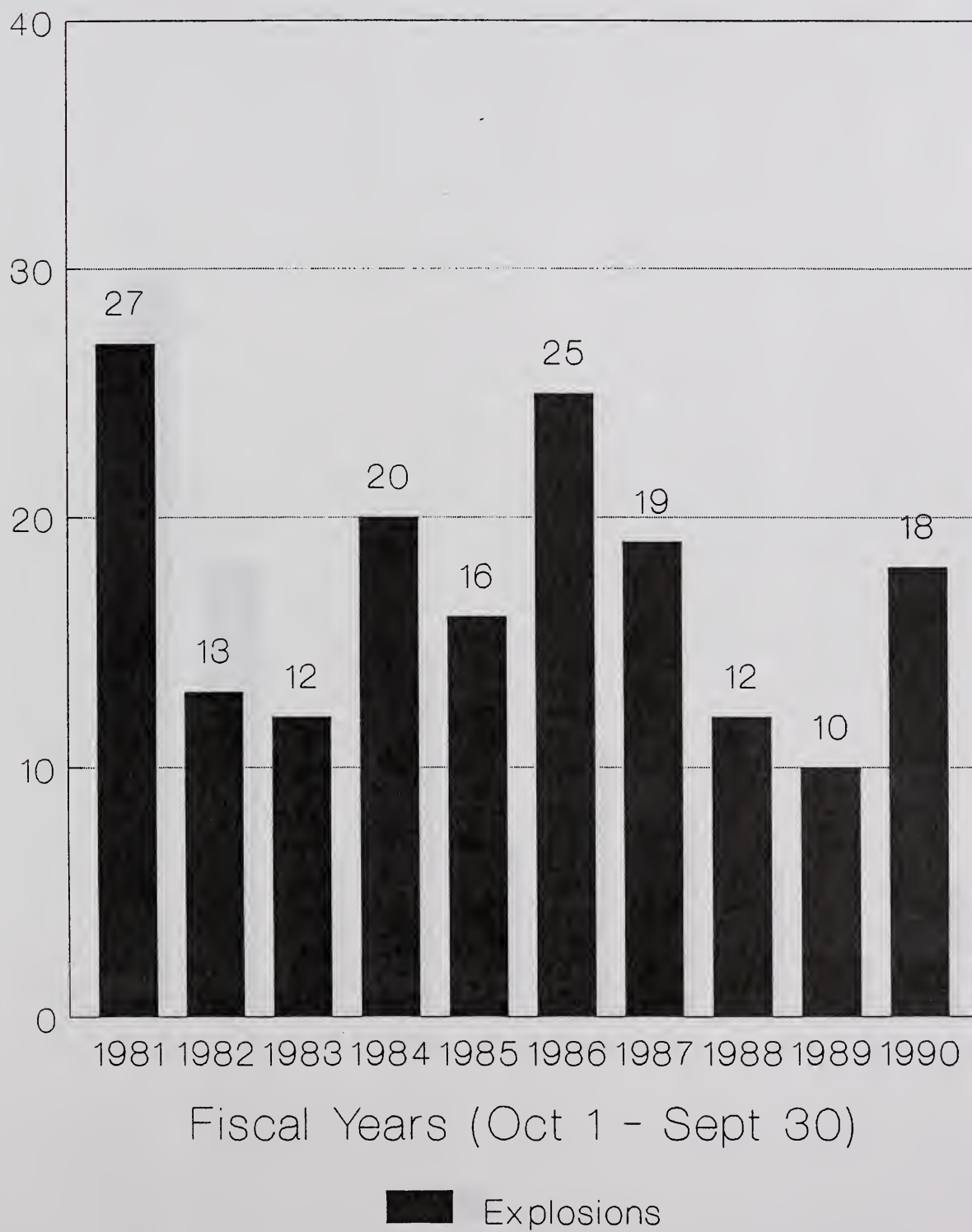
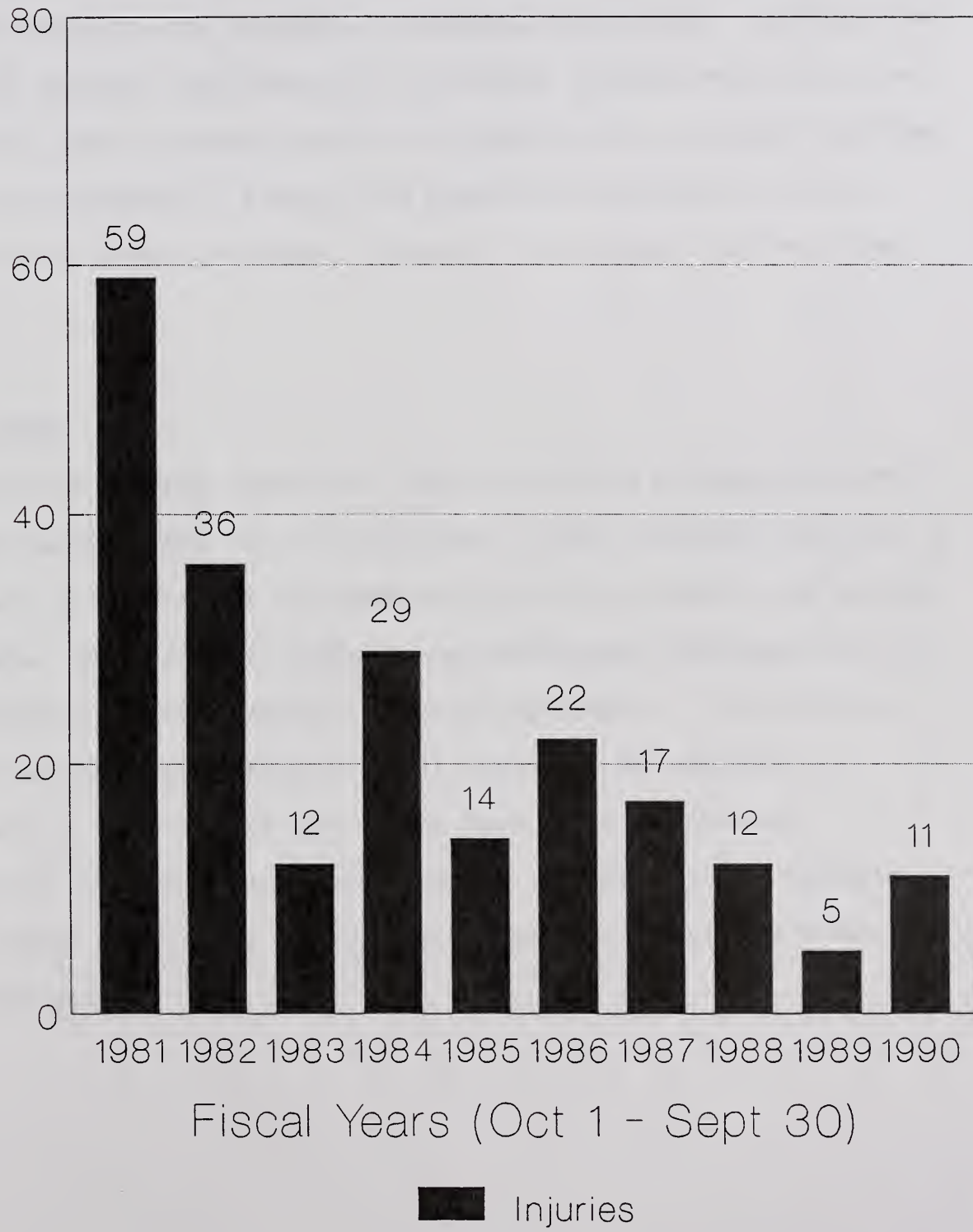


Figure 5 - Grain dust explosions
FY 1981-90



USDA GRAIN STORAGE, HANDLING, AND PROCESSING
SAFETY PROGRAM INITIATIVES

EXTENSION SERVICE

BACKGROUND:

The ES is the educational agency of the Department of Agriculture and the Federal partner in the Cooperative Extension System (CES). The CES links research, science, and technology to the needs of people where they live and work. This nationwide network and resources of professional staff and community volunteers is a unique and integrated partnership involving Federal/State/county government, research, agribusiness, and the private sector.

INITIATIVES:

(Initiative 2) Several Cooperative Extension Service workshops were held in Oklahoma and Texas, for Grain Elevators. This program was initiated in 1987 and has trained over 100 commercial elevator employees in 15 separate workshops. Eight of these workshops were management workshops; five were on fumigation and two focused on elevator maintenance. Grain elevator safety and worker protection were well covered in all workshops. A workbook was developed for each of the three types of workshops.

Additional information can be obtained from Mr. Roland Noyes, Extension Agricultural Engineer for the Cooperative Extension Service at Oklahoma State University.

A new publication EXTINGUISHING SILO FIRES has been produced by the Northeast Regional Agricultural Engineering Service (NRAES). From this handbook, firefighters learn about the different types of silo fires and how to safely and effectively extinguish them. The causes of silo fires, including the chemical reactions and dryness of silage materials, and the elements of good silage are discussed. The handbook also outlines silage management and fire prevention practices on the farm. One page of the book is designed in fact sheet format for easy distribution to farmers via community education and awareness programs.

NRAES has distributed copies to each agricultural engineering contact in the Northwest Region, and the Midwest Plan Service (MWPS) has distributed a copy to each Cooperative Extension System contact and Agricultural Experiment Station contact in the member States. NRAES reports sales of 1179 copies outside the northeast and 467 copies in the northeast for 10/88 - 09/89.

USDA GRAIN STORAGE, HANDLING, AND PROCESSING
SAFETY PROGRAM INITIATIVES

NATIONAL AGRICULTURAL LIBRARY

BACKGROUND:

NAL is one of three national libraries in the United States. The library's collection of books and journals totals 2 million volumes and covers all the subject areas in which the Department of Agriculture is active. NAL also produces the AGRICOLA database, one of the world's major databases, which can be searched online through database vendors and which can also be purchased on CD-ROM and be searched on a personal computer.

INITIATIVE:

(Initiative 3) NAL has established a Grain Dust Safety Information Center, a central collection of information related to research on grain dust. A portion of this collection has been microfilmed for ease of distribution. During FY 1990, additional information was added to the collection and requests for information were filled.

USDA GRAIN STORAGE, HANDLING AND, PROCESSING
SAFETY PROGRAM INITIATIVES

AGRICULTURAL RESEARCH SERVICE

BACKGROUND

The ARS' U.S. Grain Marketing Research Laboratory (USGMRL) located in Manhattan, Kansas, serves as the lead center for departmental research on grain dust and safety. The USGMRL conducts in-house research, evaluates technical proposals submitted to the Department, and otherwise provides expertise to coordinate industry and other scientific research related to grain dust. Publication of planned research on certain aspects of dust suppression with oil additives is essentially complete. Current on-site research is focused on grain-handling technology which can be used to minimize and predict grain dust emissions. Recent research relates shelled corn breakage to grain drying history, handling and susceptibility. In other studies, methods to predict grain flow rates, velocities, and trajectories were developed to aid in the design of grain handling facilities which minimize grain impact, breakage, and dust emissions. In cooperative research, large scale wheat and corn dust explosion tests to determine the effect of turbulence on ignition, flame propagation, and pressure waves are in progress. In other cooperative studies, procedures to predict the effect of guarding designs on grain flow restriction will be developed to aid the development and adoption of safety standards for guarding auger and conveyer inlets.

INITIATIVES (Based on original guidelines established in 1982):

- (4) Evaluation and Control of Damage to Grain from Handling.
- (5) Measurement and Control of Dust Emission in Grain-Handling Facilities
- (7) Systematic Studies on Explosion and Fire Risks and Hazards of Grain-Handling Systems.

ACTION FY 1990

Initiative 4.

The flow rates of wheat, corn, sorghum, and soybeans through circular and square vertical orifices were determined. An empirical equation was developed to predict volume flow rate of different grains through vertical orifices as a function of orifice type, orifice size, and grain moisture content. Tests to determine velocity and trajectories of grain flowing from spreader troughs of different lengths and incline angles were conducted. Predictive models were developed and verified with additional tests during 1989-90. Additional tests are underway to determine the effect of orifice shape. Grain flow data for circular, rectangular, and triangular orifices using large grain lots were collected and are currently being summarized for publication. These data and other results will be used to determine the resistance to flow for standardized procedures for safety guarding used at auger or conveyor inlets. This effort is in cooperation with the University of Minnesota and Virginia Polytechnic and State University staff who are preparing and reviewing safety standards for ASAE.

Publications:

- 1) Chang, C.S., H.H. Converse, and J.L. Steele. 1989. Flow rates of grain through vertical orifices. Approved for publication, Trans. of ASAE, Nov. 1989.
- 2) Chang, C.S., H.H. Converse, and J.L. Steele. 1989. Trajectories of grain particles from a trough-type grain spreader. Approved for publication, Trans. of ASAE, Nov. 1989

Initiative 5.

Combine-harvested corn (23-25% moisture) was dried using different drying procedures and/or drying air temperatures. The lowest dust emissions were obtained from the natural air dried corn. The highest dust emissions were from corn in-bin dried at 105° C. For repeated elevator transfers, BCFM in the test lots increased linearly at different rates depending on the drying treatment. The rates of increase in BCPM were better correlated to the Stein breakage susceptibility scores when compared to those from the Wisconsin breakage susceptibility test method.

Publications:

- 1) Converse, H.H. and S.R. Eckhoff. 1989. Corn dust emissions with repeated elevator transfers after selected drying treatments. Trans. of the ASAE 32(6):2103-2107.

Initiative 7.

The project, "Grain Dust Explosion and Control" PL-ARS-135, was conducted by the Institute of Heat Engineering, Warsaw University, Warsaw, Poland, in cooperation with the Aviation Institute, Warsaw University and the Central Mining Institute Experimental Mine "Barbara," Mikolow, Poland. The areas of research include:

- * Dynamics of dust-air mixture ignition.
- * Studies of "laminar" and "turbulent" dust flames.
- * Acceleration of dust flame.
- * Suppression of grain dust explosion.

The project is making progress in all of the above areas. Since beginning in 1987, seven technical papers describing the research have been published. A shipment of corn dust was delivered to Poland in March 1990 for use in the large scale dust explosion tests. Because of the delay in delivery of the corn dust shipment, the original 3-year study has been recommended for a 2-year extension.

The first annual report discussed the research on dynamics of grain-dust mixture ignition that focused on the preparation of the test stand for both spark and dynamically heated surface ignition tests. Early results indicated a strong influence of

turbulence level on ignition parameters. Turbulence can increase the flame propagation velocity up to four times, compared to the flame propagation in an "undisturbed" dust-air mixture.

From the second annual report, the large-scale combustion of dust layers was carried out at the experimental mine. The influence of ignition source on critical dust layer thickness was investigated. A dust loading of 100 g/meters squared on the gallery floor was sufficient for explosion, propagating a velocity close to 80 m/s and creating an overpressure of 50 kPa. The above loading level equates to a dust layer thickness of about 0.33 mm, which is substantially less than current OSHA requirements. On-site review of the project in 1989 has been delayed pending arrival and testing of corn dust shipment from the U.S.

Through the USDA/OICD, the USSR is seeking to establish cooperative grain dust and explosion research with the U.S. In May 1989, OICD representatives, Dr. Kauffman, University of Michigan and others met with a three-man Soviet Delegation to discuss the potential for cooperative research. Dr. Dunkle, Director, USGMRL, attended and represented ARS in the discussion. Since that meeting, USGMRL has received no information regarding plans for cooperative research. U.S. Wheat Associates hosted a tour and a short course on grain grading for

Russian Delegation in August 1990. The delegation did not visit USGMRL in August as planned. ARS currently expects to contribute technical expertise only if cooperative activities become a reality.

Publications:

- 1) Goral, P., and P. Wolanski. 1989. The influence of turbulence on ignition of grain dust-air mixture by a hot wire. Proc. XIth International Symposium on Combustion Processes, Miedzyzdroje, Poland, Sept. 27.
- 2) Sacha, W., P. Wolanski, and Zalesinski. 1989. Shock wave driven combustion of grain dust-air mixture. Proc. XIth International Symposium on Combustion Processes, Miedzyzdroje, Poland, Sept. 27.
- 3) Wolanski, P., and M. Wolinski. 1989. Experimental investigations on shock wave interactions with combustible dust layer. Proc. XIth International Symposium on Combustion Processes, Miedzyzdroje, Poland, Sept. 27.

USDA GRAIN STORAGE, HANDLING, AND PROCESSING
SAFETY PROGRAM INITIATIVES

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

BACKGROUND:

Agricultural Stabilization and Conservation Service (ASCS) administers farm commodity, conservation, environmental protection, and emergency programs.

These programs provide for commodity loans and price support payments to farmers; commodity purchases from farmers and processors; acreage reduction; crop land set-aside and other means of production adjustment; conservation cost sharing; and emergency assistance.

Financing of ASCS commodity programs is through the Commodity Credit Corporation (CCC), a Government entity for which ASCS provides operating personnel.

ASCS maintains a headquarters office in Washington, D.C.; an office in each State and in most counties; a Caribbean area office in Puerto Rico which also serves the Virgin Islands; a commodity office and a management office in Kansas City, Missouri; and an Aerial Photography Field Office in Salt Lake City, Utah.

The Agency is headed by an Administrator, an Associate Administrator, and four Deputy Administrators.

The Deputy Administrator, Commodity Operations, administers activities in commodity operations, warehousing, storage agreements, and the Kansas City Commodity Office (KCCO). Warehouse examiners assigned to the KCCO perform warehouse examinations at grain-handling facilities licensed under the United States Warehouse Act and/or approved under the CCC's Uniform Grain Storage Agreement.

INITIATIVE

(ASCS Internal Initiative) A different approach was utilized this year for the safety segment at our field examiners annual conferences in addition to safe driving training, all examiners were invited to relate some of their personal observations about the safe and unsafe conditions they had encountered in the course of their warehouse examinations. This discussion gave the senior examiners an opportunity to share their knowledge and experience with their younger counterparts. These discussions proved to be very enlightening as well as entertaining.

Bureau of Mines

NGFA VISIT TO THE LAKE LYNN LABORATORY

On August 7 at the Lake Lynn Laboratory, members of the Pittsburgh Research Center met with a delegation from the National Grain and Feed Association (NGFA) to discuss how the Bureau might be able to help the grain industry to prevent and suppress dust explosions. The members of the NGFA delegation included: Mr. T. C. O'Connor, Mr. G. E. Weatherford, Mr. J. E. Maness, and Mr. J. Voight.

The meeting program at the Lake Lynn Laboratory included a presentation by the Bureau on its fire and explosion research capabilities, the witnessing of two grain dust explosions, and a tour of the Lake Lynn Experimental Mine. The Bureau's presentation dealt mainly with the applicability of the solar panel to detect an explosion flame and triggered barriers to suppress the explosion. The technical discussions focused on triggered barrier research at the Lake Lynn Experimental Mine (LLEM) that would facilitate the evaluation of triggered barriers deployed close to a potential ignition source.

RESEARCH PROPOSAL

Taking into account NGFA input, the Bureau of Mines revised its research proposal on characterizing and suppressing grain dust explosions and submitted it to the NGFA for their comments on September 10, 1990. The new draft proposal entitled "Suppressing Grain Dust Explosions" is for a 2-year effort that is to be conducted at the Lake Lynn Laboratory and at granary storage locations. The proposed funding level is \$150,000 per year.

The objectives for the study are as follows:

- (1) To design triggered water barrier system for development against grain dust explosions;
- (2) To suppress grain dust explosions in a large-scale simulated tunnel complex;
- (3) To characterize the explosion hazard of corn starch accumulations; and
- (4) To conduct endurance tests with disarmed triggered barrier systems at grain storage complexes.

OVERVIEW OF BUREAU OF MINES RESEARCH IN FIRES AND EXPLOSIONS

At the spring 1990 meeting held in San Antonio, Texas, to address granary safety issues, Mr. Michael Sapko of the USBM's Pittsburgh Research Center presented an overview of the Bureau of Mines research efforts in fire and explosions.

Relevant to research conducted at the Lake Lynn Laboratory, no underground explosions have been conducted using grain dust; all the underground explosion tests used methane and/or coal or gilsonite dust. All underground tests involving triggered barriers were configured for the coal mine environment. All the fixed location barrier tests, involving water bag units, were conducted in D-Drift of the LLEM.

The results of the triggered barrier tests against gas explosions are most encouraging. Triggered barriers might be applicable to the grain industry.

National Grain and Feed Association

The National Grain and Feed Association is very proud to report the development of three new safety related training videos in 1989.

(1) Fuel for Thought: Controlling Fuel Sources in Grain Elevators.

This video examines the types of explosion fuel sources and ways to control them.

(2) Fire Defenders: Fire and Explosion Control Systems. This video describes the elements of a fire or explosion and the operations and maintenance procedures used to control them. This is an excellent tool for training employees on emergency action plan requirements.

(3) No Chance Here: Controlling Ignitions Sources in Grain Elevators. The video examines ignition sources and ways to avoid them. Topics included in this video are: Causes and prevention of ignition sources, guarding against improper hot work; frictional rubbing of belts and pulleys, electrical equipment

malfunctions; grain dryer fires; and proper bearing installation, lubrication and maintenance. This video was recognized for excellence in education and training at the Industrial Film/Video Festival in October 1990.

This is a significant project costing close to \$68,000 which clearly demonstrates our member's commitment to safety education and training.

Exhibit D

Program of the
Grain Industry Safety and Health Center

A Service of the
Grain Elevator and Processing Society

Specialists in a wide range of grain operations issues, the Grain Elevator and Processing Society (GEAPS) offers an extensive array of resources to the grain handling and processing industry.

Significant among them is the GEAPS Grain Industry Safety and Health Center (GISHC), which provides safety and health training materials tailored to helping grain operations professionals keep their employees and facilities safe. Programs address fire and explosion hazards, operational hazards, emergency action planning, loss prevention, chemical hazards, transportation hazards, and contractor safety. (See list of available programs.)

The largest gathering of its kind, "GEAPS Exchange" is the grain handling and processing industry's annual opportunity to assemble hundreds of operations professionals and technical experts. The 3-day educational program explores topics ranging from "nuts and bolts" to facility management. Special emphasis is placed on achieving the optimal combination of operations efficiency and safety and health assurance.

The Exchange Expo assembles an exhibit hall full of products, equipment, and services for grain operations. Attendees have the unique opportunity of exploring state-of-the-art technology along with the tried and true tools of their business.

Other services provided by GEAPS to the grain handling and processing industry include:

-- Networking Opportunities. A system of 35 chapters stretching across North America provides monthly meeting opportunities for thousands of grain operations professionals. Technical presentations and peer contact encourage attendees to tune in to industry developments.

-- Publications. GEAPS produces a 12-page monthly newsletter, "In-Grain," which is the industry's source for grain operations expertise. Articles on safety and health developments, grades and weights issues, government regulation, and operations efficiency guarantee that readers are kept up-to-date on their industry. The annual "GEAPS DirectaSource" is a resource guide for grain operations, including sections on industry associations and regulatory agencies, along with GEAPS member listings and the most extensive "buyers' guide" in the industry.

GISHC Safety and Health Training Programs

Guidebooks

- . Contractor Safety Orientation
- . County Elevator Safety and Health
- . Chemical Hazard Communication
- . Emergency Action Planning
- . Loss Prevention/Safety and Health

Video/Slide-Tape Programs

- . Loss Prevention/Safety and Health
 - Common Hazards/Common Sense
- . Preventing Grain Dust Explosions
 - An Introduction
 - Controlling the Ignition Sources
 - Controlling the Fuel Sources
- . Occupational Health
 - Hazard Recognition
 - Respiratory Protection - Breathing Easier
- . Operations/Maintenance Safety
 - An Introduction
 - Safe Bin and Tank Entry
 - Lock-Out and Tag
 - Electrical Hazard Awareness
 - Walkways and Work Surfaces
 - Bucket Elevators
- . Transportation Safety
 - Truck and Rail Handling

Poster Series

- . Preventing Grain Dust Explosions
- . Operations/Maintenance Safety

Audio Cassettes

- . Grain Dust - Fires and Explosions
- . Risk Takers
- . Rules and Procedures Make the News

Food and Allied Service Trades

The Food and Allied Service Trades Department, AFL-CIO (FAST) represents sixteen national and international organizations whose members are employed primarily in America's food industries. Several of these organizations represent workers in the grain handling and processing industries. These include: The American Federation of Grain Millers; The Retail, Wholesale, and Department Store Union; The United Food and Commercial Workers; The Transportation-Communications Union; and The Oil, Chemical, and Atomic Workers International Union.

Because of these affiliations, FAST has produced a number of educational materials designed to teach workers about occupational safety and health hazards associated with work in the grain handling and associated industries.

FAST has developed a manual for workers entitled "The Exploding of the Grain Belt" which details the hazards associated with the explosive potential of grain. This manual was written and produced with funds provided by OSHA under its New Directions program.

Under this same New Directions grant, FAST produced a variety of factsheets about various hazards associated with grain handling. Included among these factsheets are:

1. A collection of factsheets compiled into a minibooklet entitled Warning: Grain Dust May Be Hazardous to Your Health
2. A factsheet entitled "Confined Space Entry"
3. A factsheet entitled "Safe Bin Entry"
4. A factsheet entitled "Grain Dust Fires and Explosions"
5. A factsheet entitled "Preventing Dust Explosions: Bucket Elevator Hazards and Design"
6. A factsheet entitled "Methyl Bromide"
7. A factsheet entitled "Malt Worker's Lung"
8. A factsheet entitled "Malathion"
9. A factsheet entitled "The Health Hazards of Grain Millers"
10. A factsheet entitled "Grain Fever"
11. A factsheet entitled "Preventing Health Hazards From Grain Dust"
12. A factsheet entitled "Farmer's Lung"
13. A factsheet entitled "Fall Protection"
14. A factsheet entitled "Asthma"
15. A factsheet entitled "Bronchitis"

Also under this grant, FAST produced two slide shows entitled "Something in the Grain" and "A Kernel of Protection" that detail the hazards associated with work in a grain handling facility.

FAST has produced several other resources on a variety of health and safety topics.

